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ABSTRACT

The materials in this educational packet are designed for use with students in grades 4 through 7. They consist of an overview, teaching guides and student data sheets for three activities, and a poster. The overview discusses why, how, where, and when birds migrate as well as problems birds encounter while migrating; the importance of research and management is also addressed. A glossary and list of reference materials are included. The teaching guides contain a list of learning outcomes, instructional strategies, a list of materials needed, and an activity review sheet (with answers). The activities focus on: (1) three methods of migratory bird navigation, difficulties encountered during migration, and using a compass to follow a course; (2) mapping the migration route of a flock of Canada geese; and (3) the migration of the whopping crane (this activity is in the form of a board game). The poster is used to illustrate the migratory routes of several species and Canada geese. Two additional activities are included: making a bird by means of paper folding (origami) and matching illustrations of birds in flight to their names and resting silhouettes. (JN)

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Migratory Birds

Issue Pac

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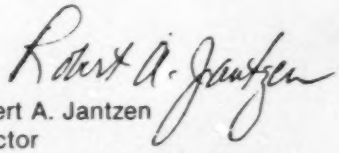
A Message To Educators

The Fish and Wildlife Service manages millions of acres of land, conducts wildlife research, raises fish for restocking depleted waters, and performs hundreds of other tasks designed to benefit fish and wildlife resources. However, as important as these activities are, we realize that in the long run an informed, motivated, and involved public can do more to benefit wildlife than all of our management activities.

This education package represents an important step in our efforts to provide teachers and other educators with factual information about wildlife, habitat, and resource management. We hope that you find these materials useful and that you will encourage your students to learn more about America's wildlife heritage.



Robert A. Jantzen
Director
U.S. Fish and Wildlife Service

These materials are designed for use with students in grades four through seven.

Contents

Leader Overview
The Overview discusses some of the whys, hows, wheres, and whens of bird migration. Studies have shown that while migration is a fascinating and complex occurrence, many questions still remain unanswered. Problems birds encounter while migrating, along with the importance of research and management, are also addressed. Boldfaced words are defined in the Glossary and reference materials are listed under Resources

Poster: Side 1
"Snows" and "blues," the two color forms of the snow goose, migrate from breeding grounds in northern Canada to wintering areas on the Gulf coast. This striking poster shows two geese watching a flock of snows begin its migration.

Poster: Side 2
This poster depicts the migration routes of several migratory bird species. Use this poster with Activity 2 and as a general reference to the patterns and diversity of migration.

Student Page 1: Origami Bird
Students create a bird by using the ancient Japanese art of paper-folding (origami).

Student Page 2: Migration Identification
Migratory birds are often observed in flight. Students match illustrations of birds in flight to their names and resting silhouettes.

Activity 1: Migrating with the Birds
Students will have a chance to "migrate" using some of the techniques birds have developed. Students will learn:
- Three methods of migratory bird navigation;
- How to use a compass to follow a course; and
- Some of the difficulties encountered during migration.

Activity 2: Migratory Mapping
Based on an analysis of actual band recoveries students will map the migration route of a flock of Canada geese. Students will learn:
- The location of Canada goose nesting and wintering areas;
- The migration route of Canada geese; and
- The relationships between band recoveries and bird research.

Activity 3: The Crane Game
Students will play a board game based on the migration of whooping cranes. Students will learn:
- The location of whooping cranes' wintering and breeding grounds; and
- Some of the hazards that whooping cranes face during migration.

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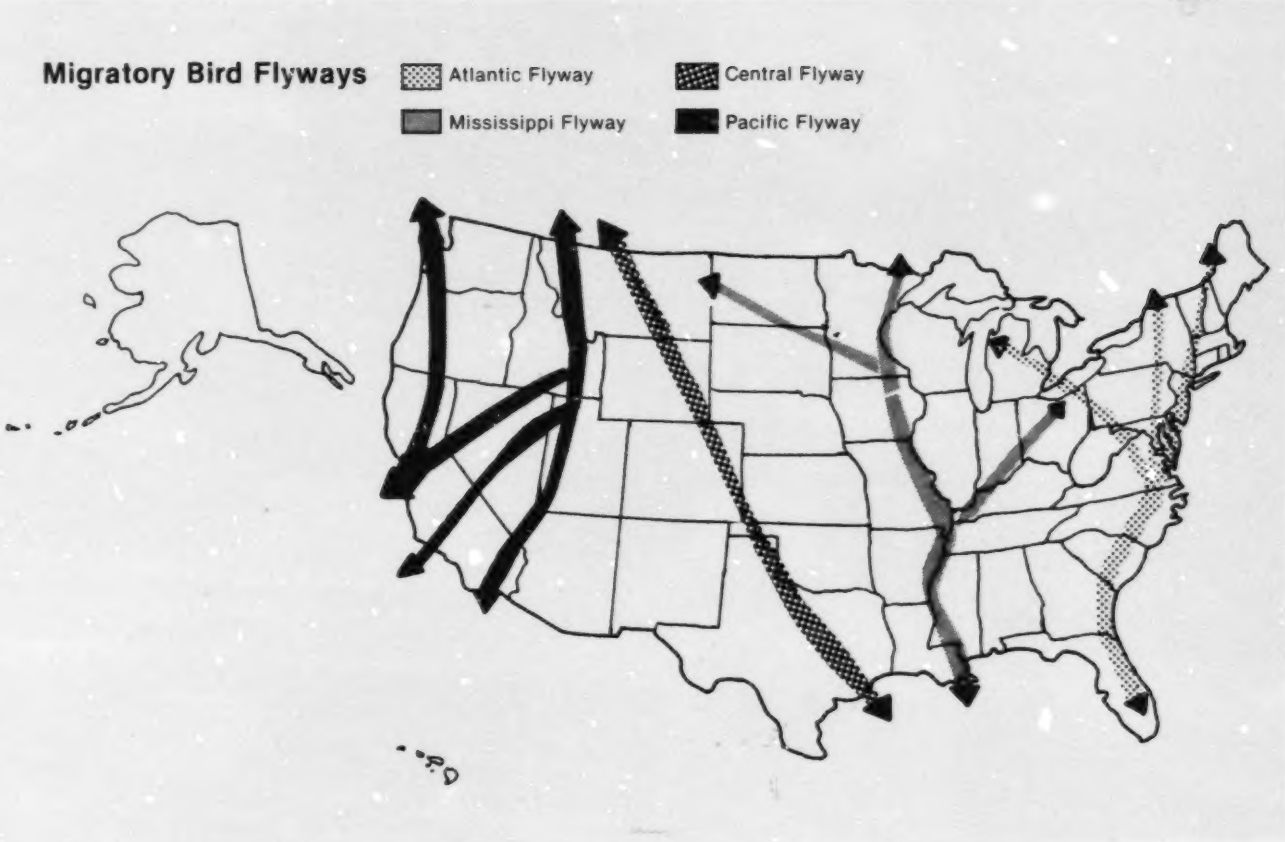

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Migratory Birds

Leader Overview

In spring and autumn, the sky can become dark with countless birds flying between their **breeding grounds** and **wintering grounds.** This seasonal or periodic movement, called **migration,** is not unique to birds. Various wildlife species ranging in size from butterflies to whales are migratory. While most birds migrate, many, such as the cardinal and bobwhite quail, do not. The reasons for migration, the problems surrounding it, and the management of migratory birds will be explored in this Pac.

Why Do Birds Migrate?

The reason birds migrate can be explained only partially at this time. Several theories for migration have been identified, and it is probably a combination of factors that stimulates birds to migrate. One theory suggests that changes in weather which affect the availability of food and water cause birds to migrate. Waterfowl obviously cannot feed in frozen lakes and many insect-eating birds leave the north to winter in Central America after feeding on the abundant Arctic insects all summer. A second theory links migration to genetic or inherited characteristics by suggesting that migration is an instinctive return to ancient habitat areas.

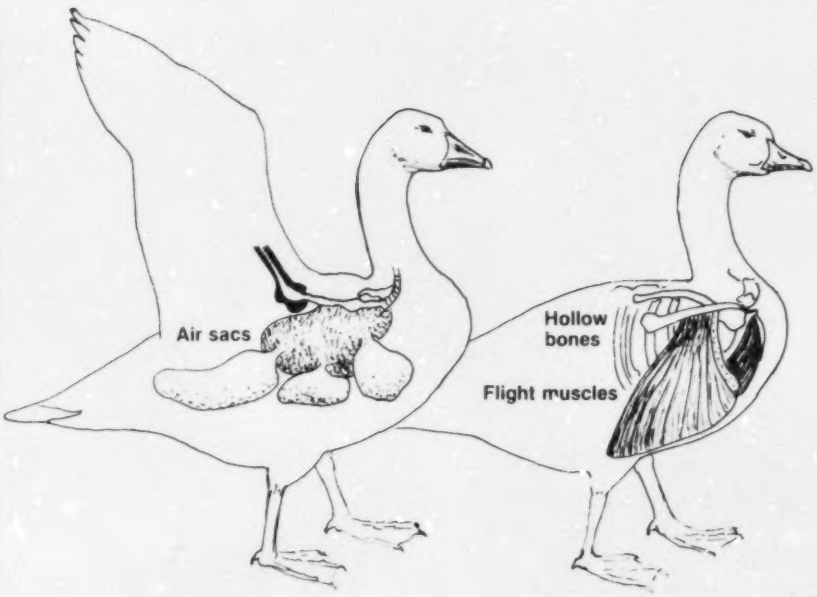
Migrating Canada geese

How Do Birds Migrate?

During migration, birds accomplish remarkable feats. For instance, a ruby-throated hummingbird can fly 500 miles in 25 hours, an average of 20 mph; mallards can fly as high as 21,000 feet; geese attain speeds of 50 mph; and greater shearwaters migrate 8,000 miles annually. The destinations of migratory birds are as amazing as their flights. After a journey of 3,000 miles, the Tennessee warbler has been known to return to the same tree in which it nested the preceding year.

Migratory methods are also varied and fascinating. In addition to the usual method of flying, some seabirds migrate by swimming; mountain quail migrate by walking down mountain slopes.

Several senses and adaptations enable birds to migrate. For a start, most migratory birds have very powerful flight muscles. They also have a highly developed respiratory system, hollow bones, internal air sacs, and specialized body shapes. All of these features



enable them to fly high, fast, and for long periods of time.

In addition, most birds have very sharp vision. This enables them to use distant landmarks and the sun or stars as directional cues. Other helpful aids include an ability to see ultraviolet light, hear low-frequency sounds (like the surf against a distant beach), detect the magnetic and gravitational fields of the earth, and sense weather frontal systems and changes in barometric pressure. One or several of these aids may be used depending upon the species and the route traveled.

When Do Birds Migrate?

Times of annual migrations vary. For instance, while many shorebirds begin their fall migration in early July, other species, such as geese, do not begin until late fall. And while some birds have a leisurely migration schedule, others fly swiftly to their destinations. In general, however, migrations in the fall are less hurried than in the spring. It is believed that spring migrations are faster because of the stimulus to breed and nest.

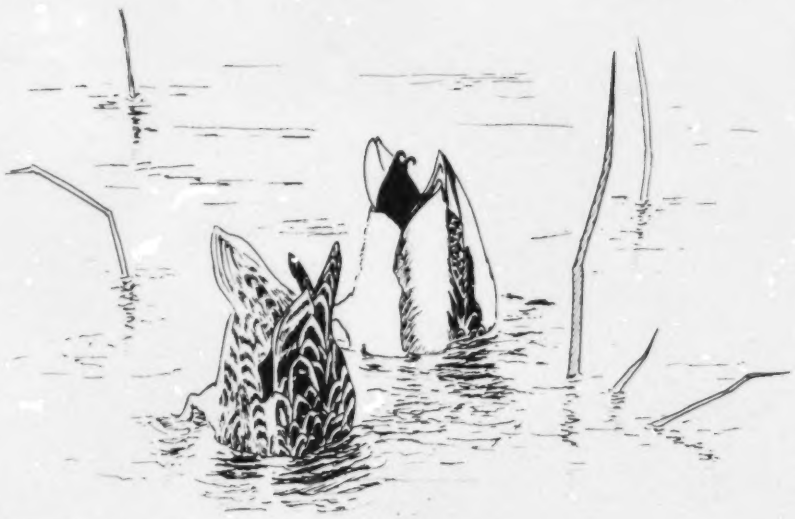
The time of day when migration occurs also varies. In general, most small birds migrate by night. Ducks and geese may migrate both day and night. Observations made with telescopes focused on the full moon have shown birds migrating over one area at a rate of 9,000 birds per hour! Travel by night enables some of the small birds to avoid their enemies. In addition, by traveling at night, birds can spend the day feeding and resting. Day migrants include loons, cranes, gulls, hawks, and vultures. Soaring birds such as broad-winged hawks migrate only during the day because they are dependent upon updrafts created by the sun.

Where Do Birds Migrate?

Migration can take birds from the Arctic to Antarctica. While most species' journeys are not that long, many birds—even small songbirds—do travel impressive distances. This makes bird migration an international concern. Where birds migrate depends on a variety of elements, but the importance of food, water, and shelter must not be overlooked. Many species of birds will seemingly travel several thousand miles out of their way but actually take that route because of the availability of food sources.

While general directions of flight are consistently followed by migrating birds, it is important to remember that the term "migration route" does not mean an exact, specific route between wintering and breeding grounds. Routes tend to follow major habitat types, avoid crossing obstacles like mountain ranges, and provide the necessary food, water, and shelter. Migration routes tend to follow a north-south path, but routes can also include east-west movements.

Nocturnal migrants



Temporary migration stopover

There appear to be four broad migration routes in North America. For research and management purposes these routes are depicted as four distinct **flyways:** the Atlantic Flyway, the Mississippi Flyway, the Central Flyway, and the Pacific Flyway. Of these, the Mississippi route is used most.

Difficulties Along the Way

Despite the many benefits of seasonal movement, a number of problems can occur during migration. Migrating birds are under considerable stress and use up a great deal of energy in sustained flight. A sudden storm that blows them off course or unusually cold weather that reduces their food supply can have disastrous results. Stress also makes them more susceptible to disease, as does the fact that some birds migrate in large flocks where disease can spread easily. Another problem for migratory birds is collisions with skyscrapers, picture windows, radio towers, etc.

Alteration of habitat along the flyways offers potential benefits as well as problems for migrating birds. Many marshlands and other resting places for the traveling birds have been converted to farmland. The birds must feed and rest to survive, so they often take advantage of wheat or corn fields along the way. These crops are a good food source, but many birds have begun to delay their migrations, feeding for long periods in areas with prime supplies. This not only presents a problem for the farmer but also for the birds which may suffer a higher incidence of disease or face severe weather as the seasons change. The conversion of land for many other uses such as housing or commercial development reduces the amount of food available during migration.

Migratory bird populations can also be seriously affected by contact with pesticides. For many years DDT was used to kill insects. Through the food chain process, DDT accumulates in the bodies of birds and mammals. For birds, this can result in thin-shelled eggs, infertility, and sometimes death. While DDT is now banned in the United States, it is still used extensively in other parts of the world. Therefore, birds migrating to these areas are still exposed to it.

Research and Management

A variety of research is currently being conducted to increase our knowledge of bird migrations. Methods used to collect migration data include direct observation, recordings of calls, **bird banding,** radio tracking, radar observation, and laboratory studies involving orientation, navigation, and the physiology of migrating birds.

Of all these methods, however, bird banding has probably yielded the most information. Bird banders trap or net birds and place a metal band on each bird's leg. Each band has a different number on it. This number, along with a description of the species of bird, its age, sex, and date of banding, is sent to the U.S. Fish and Wildlife Service. After the banded bird is released, it may be caught again by banders, die of disease or other natural causes, or be shot by hunters. Information on the recapture, or the band from the dead bird, is then sent to the Fish and Wildlife Service.

By analyzing the reported bands, wildlife professionals can tell where birds breed and winter, how long they live, and the times, lengths, and routes of their migration. Band recoveries provide valuable data for the biologist to use when estimating the relative abundance of a particular species in an area or population. The public can play a valuable role in this research by sending any bird band found to the address on the band.

The information obtained from research provides valuable contributions to the management of migratory birds. Some examples of how research data are used by wildlife experts include how to: combat disease outbreaks, change feeding patterns that are damaging crops, and set harvest limits for migratory bird hunters. Much of the management of migratory birds consists of making sure that adequate habitat exists along the migration routes so birds can rest and feed. Hundreds of private, State, and Federal wildlife refuges have been established to help meet these needs. Similar efforts are also conducted in other countries. This international effort is crucial to the survival of migratory birds.

Research, habitat preservation and management, and international treaties insure that migratory birds will be here for future generations.

Glossary

bird banding—Means of marking birds with metal bands to obtain data regarding their flights, migrations, and habits. When the birds are subsequently encountered, their bands are reported and location noted. Banding is a way of tracking individual birds.

breeding grounds—Geographic area occupied by migratory birds during nesting season.

flyways—General routes of travel used by birds when migrating between breeding and wintering grounds. For ducks and geese in particular, there are four major flyways in the United States: Atlantic, Mississippi, Central, and Pacific. The actual migratory routes of individual bird species may vary from these general flyway patterns.

migration—Seasonal or periodic movement between breeding and wintering grounds. Bird migration varies among species in terms of destinations, time, and duration. Generally migration is accomplished to utilize better feeding grounds.

wintering grounds—Geographic area occupied by birds in the winter. Wintering grounds are usually the most southerly range at which North American migratory birds spend the winter.

Resources

General References

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A Guide to the Behavior of Common Birds, Donald W. Stokes. Little, Brown & Co., Boston, 1979.

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Birds and How They Function, Phillip S. Callahan. Holiday House, New York, 1979.

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Films and Filmstrips

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Migration, National Geographic Filmstrip, Washington, DC, 1975.

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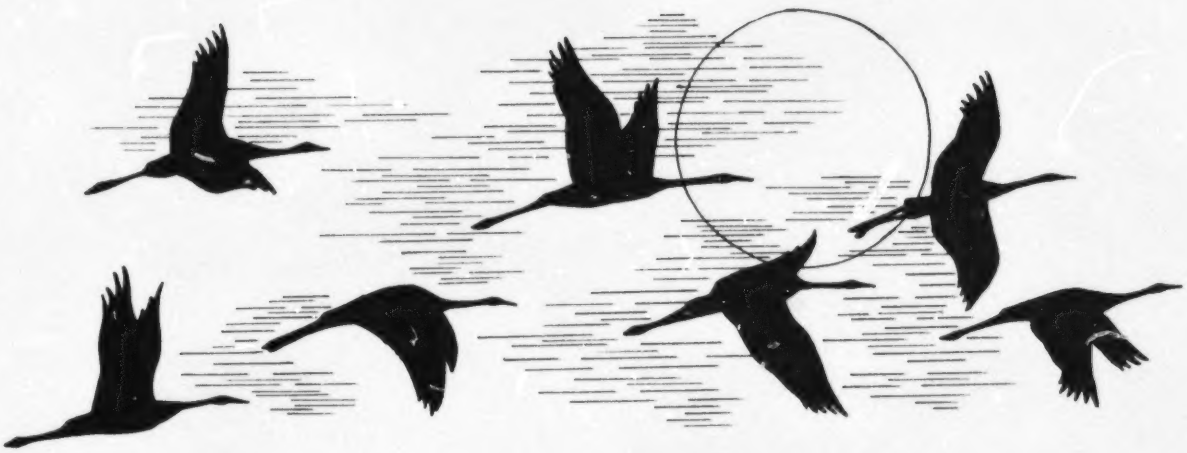
Department of the Interior/U.S. Fish and Wildlife Service, 1982

Migratory Birds

Activity 1

Migrating with the Birds



Purpose

Through a simulation exercise, students will encounter some of the difficulties of bird migration. They will also be exposed to some of the theories regarding bird migration.

Learning Outcomes

Following this Activity, students will be able to:

A. Read and work with a compass as a navigational tool.

B. List and describe three senses used in bird migration/navigation.

C. Act out a theory of bird migration.

Organization

Who: Students in groups of six or seven

Where: Large open area

When: Any time of year

Time: Two hours

Safety: **a.** Students should have their own blindfolds to reduce the danger of eye diseases. **b.** Area should be clear of holes and objects that a student could bump into. **c.** Caution students wearing blindfolds to walk slowly and carefully. Use the buddy system so that a blindfolded student is always with a non-blindfolded student.

Materials: For the Class

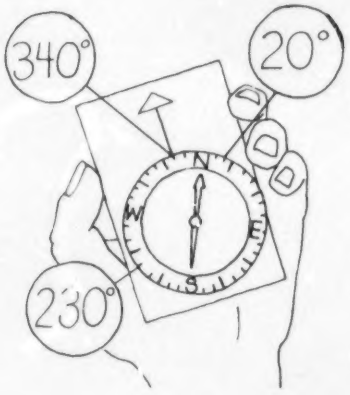
- Markers (pylons, colored flags, etc.)
- Compasses
- Clicker (noise-maker)
- Tin can
- Stop-watch or watch with second hand

Materials: For Each Student

- Blindfold
- Data Sheet
- Pencil

Directions

1. Prior to doing the Activity, set up a course like the one illustrated. Place markers at the places indicated. Bear in mind that your pace is about one and one-half times that of the average student. You may wish to ask a student from another class to help you pace out the distances. You will also need to explain to the class the use of compasses for navigation (see **Resources** for reference). Students can bring compasses from home or obtain them from scout troops, etc. Depending on the number of compasses available, have students work individually or in small groups to find the correct direction for several compass headings.



2. Divide the class into four groups. Each group will "migrate" using a different technique. Assign each group one of the following techniques. The first group will use compasses. This represents a bird's ability to detect magnetic fields. The second group will migrate using visual landmark clues. A third group will have a time limit. This represents birds migrating against the pressures of nature (i.e., a storm, extreme cold, etc.). The remaining group will be blindfolded and will use auditory clues.

3. Hand out the Data Sheet (halves) to the appropriate groups. Have each group carefully study and memorize its route including the order of the markers.

4. Appoint a student as scorekeeper. As each group starts, record the time. Then when the "flock" begins to arrive at the wintering ground, the scorekeeper will note who came in first, last, and how long "migration" took for each type of migration. Within each group, students will work individually and attempt to be the first of their group to complete "migration." If the "migration" points are not reached in the order given on the map, the student must return to start and begin again.

5. While one group is migrating, keep the other students away from the course. You may want some adults to help supervise the three groups waiting to "migrate." While they wait, the groups can study their Data Sheets, discuss the theory they will use, or consider what it would be like to be a migratory bird.

6. The first group to "migrate" will be the ones with compasses. Using the maps and compasses have the first group "migrate." Have the scorekeeper keep track of who came in first, last, and time needed.

7. The second group should be the "landmark" group. The landmark group cannot use their maps in "migrating," as birds "remember" visual clues. Collect all their Data Sheets before the group starts. In this case the markers represent landmarks such as rivers, lakes, mountains, cornfields, etc. Have the scorekeeper keep track of who came in first, last, and time needed.

8. The third group is the timed group. They may use maps, compasses, pacing directions, and landmarks. However, they have five minutes to migrate in unfamiliar territory. Again, have the scorekeeper tally results.

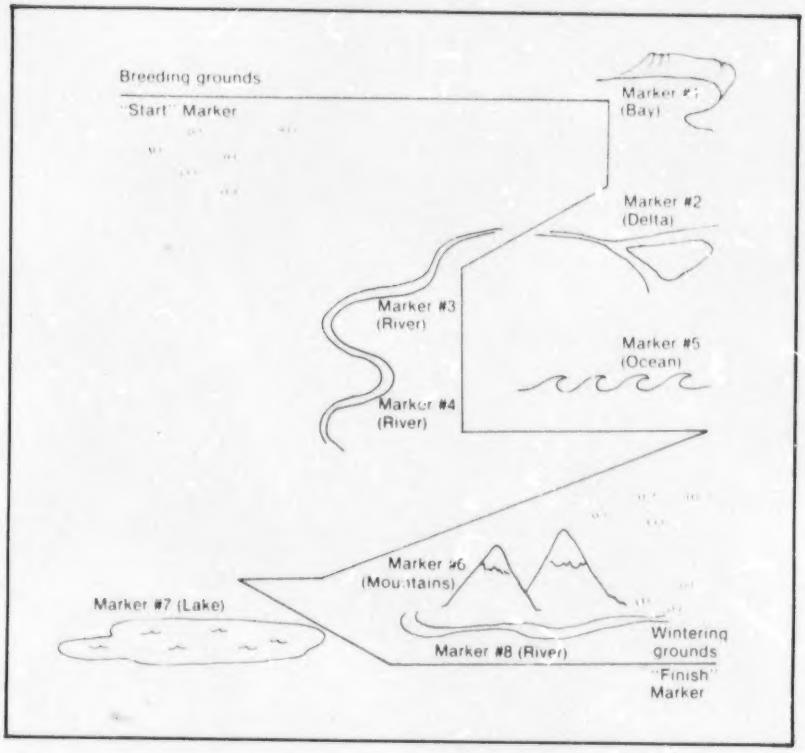


Diagram of migratory course

9. Blindfold members of the "sound navigation" group. Appoint a student to stand at each of the markers and a "buddy" for each of the blindfolded students. The students at the markers will make noises as indicated on the navigating sound map. Begin the "migration" with all sound clues and have the students stop making their sounds after the "flock" has passed the marker. There may be some confusion from overlapping sounds, but this will add to the challenge and excitement of the Activity. If the blindfolded student forgets the order of the sounds, the "buddy" can help. Have the scorekeeper keep track of who came in first, last, and time needed.

10. Back in the classroom, discuss the results of the scoring. Which group's migration was most successful? Which was least successful? What does this tell the class about human senses? About bird senses? Have the students write a paragraph discussing some of the pros and cons of the navigational technique which they tried in the Activity.

Followup

Another theory of migrational navigation is that birds use stars to direct them. Students can do further research on this theory.

You may wish to use actual environmental sounds in **#9.** Recordings of surf, wind, etc. are often available from libraries. Tape recordings of these sounds could be used at the markers.

Activity Review Answers

1. Navigation by sound enables birds to hear low-frequency sounds emanating from the landscape below. This is useful when traveling at night or in fog when landmarks are not visible.

2. b.

3. a.

4. A to B due South 180°; B to C due West 270°; C to D Southeast 135°.

5. False. These are landmarks for birds which migrate along the Atlantic Flyway. Landmarks of the Central Flyway include the Rocky Mountains and the Great Plains.

Name:

1. Why is navigation by sound important to night-flying birds?

_____

_____

_____

_____

_____

2. It is believed that birds are similar to compasses in that they have the ability to detect

_____

a. gravity.
b. magnetic fields.
c. sound waves.

3. Which of the following birds would most likely rely on sight to keep them on course during migration?
a. Golden eagle migrating by day over land.
b. Waterfowl migrating by day over ocean.
c. Songbird migrating by night over land.

4. Mark the migration route shown on the right in compass points and degrees.

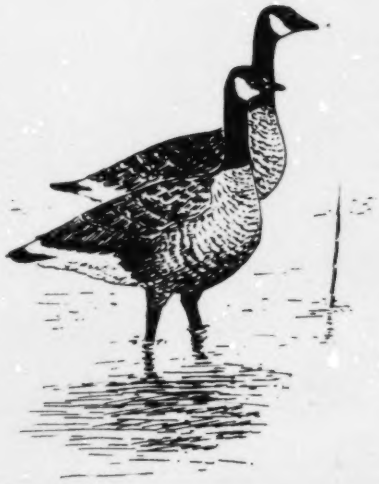
5. The Hudson Bay, the Saint Lawrence River, and the Chesapeake Bay are visual landmarks for birds migrating in the Central Flyway. True or False? _____

Department of the Interior/U.S. Fish and Wildlife Service 1982

Migratory Birds

Activity 2

Migratory Mapping



Purpose

Through this Activity, students will learn the migration route of a common migratory bird, the Canada goose. This will be done by compiling and mapping data from actual band reports.

Learning Outcomes

After completing this Activity, students will be able to:

A. Map the migration route of the Canada goose based on band reports.

B. Define the terms wintering and breeding grounds.

C. List two uses of band reports.

D. List the four major flyways in North America.

Organization

Who: Groups of four
Where: Inside
When: Any time of year
Time: One to two hours

Materials: For the Class

- Poster—Side 2
- Data Sheet—Page 1 (five copies)
- Paper bag or hat

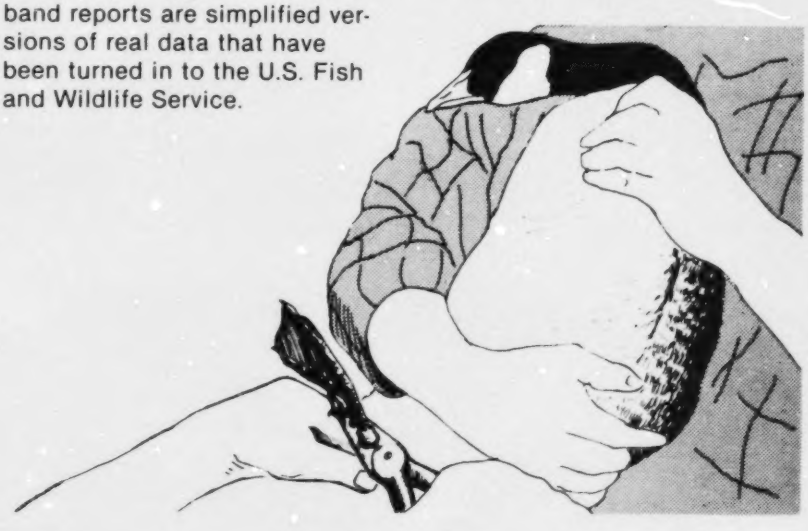
Materials: For Each Student

- Data Sheet—Page 2
- Colored pencils or crayons

Directions

1. Data Sheet—Page 1 contains 50 banding results. Make five copies of these band reports. Cut Data Sheets into 250 strips and put these into a hat or paper bag. **Note:** These band reports are simplified versions of real data that have been turned in to the U.S. Fish and Wildlife Service.

2. Lead students in a discussion of bird banding. Banding is done to provide information regarding migratory birds' routes. Through recovery of bird bands, data on direction and duration of migration is obtained. Introduce students to the idea of flyways, which are generalized migratory corridors. Although species' actual migrations do not strictly conform with these flyways, they are a useful way of generalizing migration routes. Band recoveries help to indicate along which flyways birds migrate. (For instance, the Canada goose migrates along all four flyways.) Use the Poster-Side 2 and the pocket map to illustrate the idea and locations of flyways.



3. Hand out copies of Data Sheet—Page 2 to each student. Have students first label their maps with the Canadian provinces and major bodies of water. They may use reference materials.

4. Tell students they are wildlife biologists compiling banding returns. Data are being sent to them regarding the locations of banded Canada geese. Their job is to map Canada goose migration—spring and fall—based on the reports. Tell students they will each receive data from seven or eight bands. While bands are recovered year round, the information students receive will be mainly from summer and from fall migration periods. (Have the students suggest why more bands might be recovered at these times of the year.) Students can tell the difference by the dates: spring migrations generally occur between February and April and fall migrations between September and December. Reports from January, May, June, July, and August indicate non-migrating times of the year. During the summer months geese are at their breeding grounds; during January they are wintering in more southern areas. Tell students they will plot reports on the maps they have been given. They should use different colors for migration dates, and for dates indicating presence on wintering and breeding grounds.

Completed student map

5. Pass the hat around the classroom. Each student should take one strip (band result) and mark the date on the map in the correct location. Pass the banding reports around again, and continue this until each student has received at least seven reports. If students receive two of the same result, they should plot both.

6. Have students form groups of four to compare data. Students should map the banding reports of the other group members. Based on the additional information, have students plot spring and fall migration routes based on the U.S. flyways and indicate generalized wintering and breeding grounds. Their data will indicate that the Canada geese used in this Activity breed mostly in Canada. They migrate along either the Mississippi Flyway or the Atlantic Flyway. Therefore, the routes mapped can cover most of the States north of South Carolina and east of Wyoming.

7. If possible, make an enlargement of the Data Sheet map and plot all the band reports. Ask students where band report #1 was from and if the bird was recovered during the spring or fall migration. Plot each migration period in a different color. Continue collecting information from the class and plotting it until all reports have been shown.

8. Have students pick one of the flyways and research its geography. Generate a class list of possible problem areas and favorable habitats (refuges, rivers) which Canada geese might encounter on that route.

Followup

Through research and observations made throughout the school year, students can note the varying numbers, types, and varieties of birds in the area and determine which species migrate and which do not. They can then study one migratory species they have identified in the neighborhood and use a map and bird guides to examine where the species migrates. Research should include the route and timing of migration, obstacles encountered, and traditional habitats used during migration.

If possible, have a local conservation officer or Fish and Wildlife Service employee bring in samples of actual bird bands and mounted birds with bands to discuss banding in greater detail. Have the speaker tell students what they should do if they see a band on a bird (either live or dead). Some wildlife refuges allow students to observe banding operations and on occasion will allow upper-level students to participate.

Activity Review Answers

1. The Canada geese depicted in this Activity breed mostly in Canada and migrate along either the Mississippi or Atlantic Flyway.
2. **a**—Atlantic Flyway; **b**—Central Flyway; **c**—Pacific Flyway; **d**—Mississippi Flyway.
3. True. While bands are found by many different individuals in different ways, the majority are sent in by hunters.
4. Wintering grounds—Argentina, South America. Breeding grounds—Alberta and Saskatchewan, Canada.
5. Band reports give information regarding bird migration routes, wintering and breeding grounds, life expectancy, causes of death, etc.

Migratory Birds

Activity 2

Activity Review

Name:

1. Where do the Canada geese that you studied in this Activity breed and what flyways do they use?

_____

_____

2. The map below shows the four major flyways of the United States. Based on the banding results below, which flyway would the migrating birds be using?

a. Birds banded in northern Quebec and recovered in Maine, Delaware, North Carolina, Rhode Island, Maryland.

_____

b. Birds banded in the Northwest Territories and recovered in Wyoming, New Mexico, Texas, Montana.

_____

c. Birds banded in Alaska and recovered in Oregon, Nevada, California, Idaho.

_____

d. Birds banded in Alaska and recovered in Alaska, North Dakota, Great Lakes, Tennessee, Louisiana, Missouri.

_____

3. Wildlife biologists rely on information from bands returned by hunters to learn about migratory birds. True or False?

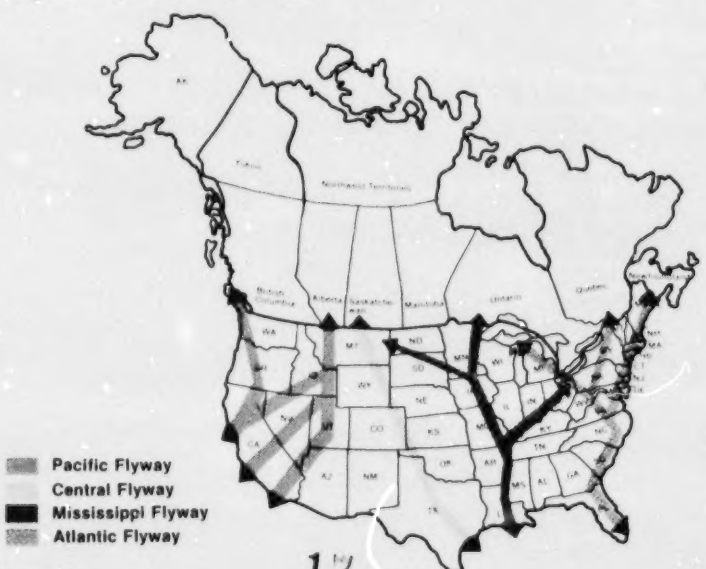
_____

4. The Swainson's hawk breeds around the beginning of May. Based on the following banding results, where do you think this bird winters? _____

_____

Breeds? _____

- Shot in Mexico, October 1980.
- Banded in Alberta, July 1977, and found dead in Kansas, August 20, 1978.
- Banded in Saskatchewan, July 13, 1974 and found dead in Argentina, March 4, 1976.



5. List two examples of information obtained from band reports.

a. _____

_____

b. _____

_____

Department of the Interior/U.S. Fish and Wildlife Service, 1982

Migratory Birds

Activity 3

The Crane Game

Organization
Who: Groups of four or five
Where: Indoors
When: Any time of year
Time: One to two hours

Materials: For Each Group
- Cardboard or poster board
- Glue
- Scissors
- Spinner
- Pencil
- Paper
- Game board
- Data Sheet

Purpose
By playing a board game, students will become aware of some of the human and natural factors that influence bird migration.

Learning Outcomes
After completing this Activity, students will be able to:
A. Locate on a map the breeding and wintering areas of whooping cranes.
B. List three positive and three negative influences on whooping crane migration.
C. Write a paragraph discussing the hazards of whooping crane migration.

Directions
1. Explain to the class that whooping cranes are endangered birds, which were almost extinct at one time. Whooping cranes generally migrate along the Central Flyway. They are large white cranes with red faces, noted for their unusual trumpeting call. Through careful management and strict protection of their habitat, their numbers have increased in recent years. A number of hazards face whooping cranes, and students will discover some of these problems as they play this game and try to keep their individual crane flocks intact during migration.

2. Divide the class into groups of four or five. Give each group a copy of the game board, which is on the last page of the Activity. Also hand out copies of the Data Sheet to each group. Have students cut out markers and spinners, and glue these on cardboard. Mount each spinner on a pencil as shown on the Data Sheet.

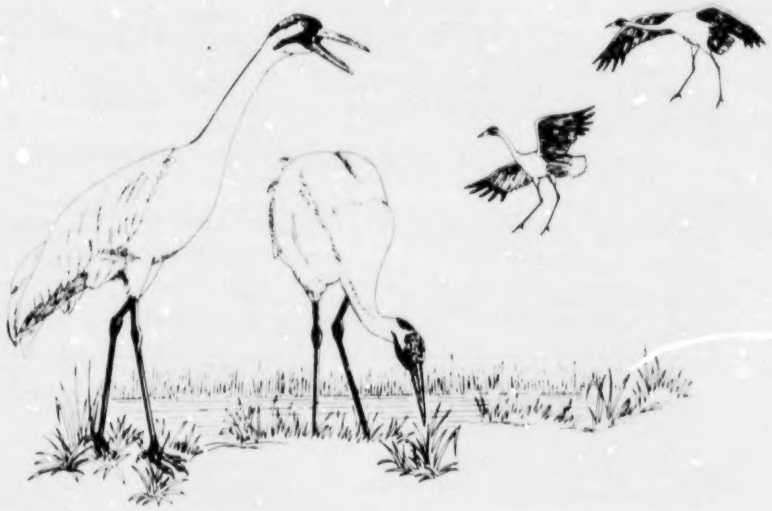
3. Explain the object and rules of the Crane Game to the class. These are written on the Data Sheets; have students read along as you explain the game. The game is played by moving markers around the board and following the instructions written on the spaces. The object is to be the player to get to the last space (Texas) with the highest number of whooping cranes left in the flock.

4. Have each group place their markers face down on the board. Each player then draws a marker. The student who draws marker #1 goes first and play continues clockwise.

5. Each player makes a score sheet based on the sample shown on the Data Sheet. Here they keep a running tally of their crane flock. Each person begins with 100 birds.

6. Each player in turn spins the spinner and moves the corresponding number of spaces (indicated by the side of the spinner which lands on the table). Players follow the instructions for the space on which they land. Players may go either way when they reach the detour. The detour is longer but safer. Play continues until all have reached Texas for the winter. The player with the most cranes is the winner. If two players have the same number of cranes left, the one who reached Texas first wins.

7. Follow the game with a brief class discussion of the hazards of migration. Have students write a paragraph summarizing the hazards and benefits of whooping crane migration, based on library research and what they learned while playing this game.



Whooping cranes winter in coastal Texas.

Activity Review Answers

1. Answers include storms, disease, high winds, exhaustion, collision, illegal shooting, lack of sufficient food and lack of water.
2. Breeding grounds are in Alberta, Canada. Wintering grounds are in Texas.
3. By managing migratory routes, i.e., maintaining stopover sites and suitable habitats; by maintaining bird refuges; and by preventing illegal shooting and/or harassment of cranes.
4. No. In 1981 fewer than 100 whooping cranes were left in the wild, and they eat mostly insects, frogs, and other small animals.
5. North Dakota, South Dakota, Kansas, Nebraska, Oklahoma, and Texas.

Migratory Birds

Activity 3

Activity Review

Name:

1. Name three hazards to whooping cranes during migration.

a. _____

b. _____

c. _____

2. On the map below, indicate the breeding and wintering grounds of whooping cranes.

3. How can humans aid in whooping crane migration?

a. _____

b. _____

4. Do whooping cranes cause problems for farmers? Circle your answer.

Yes No

5. Name four States whooping cranes pass through during their migration.

a. _____

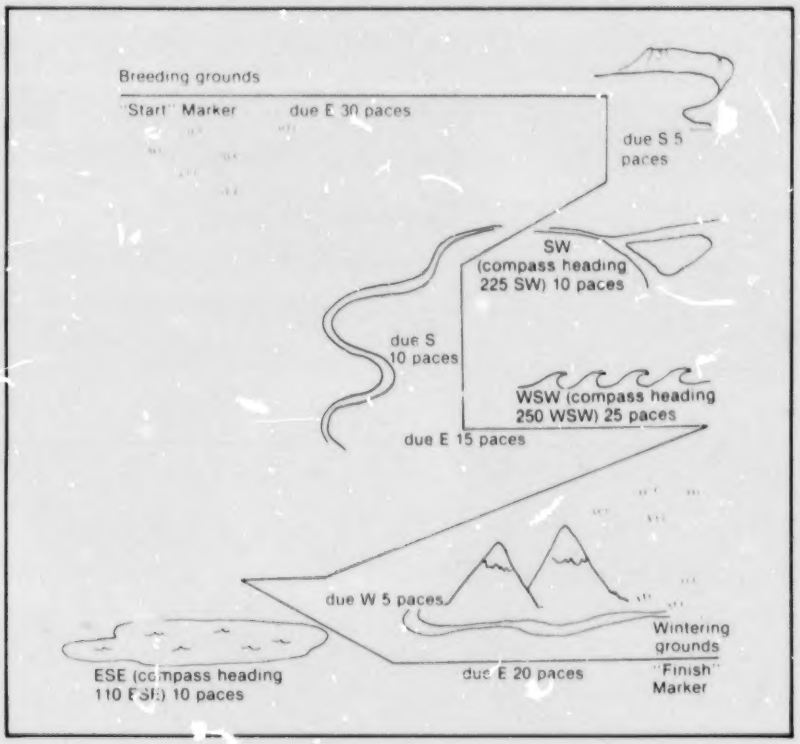
b. _____

c. _____

d. _____

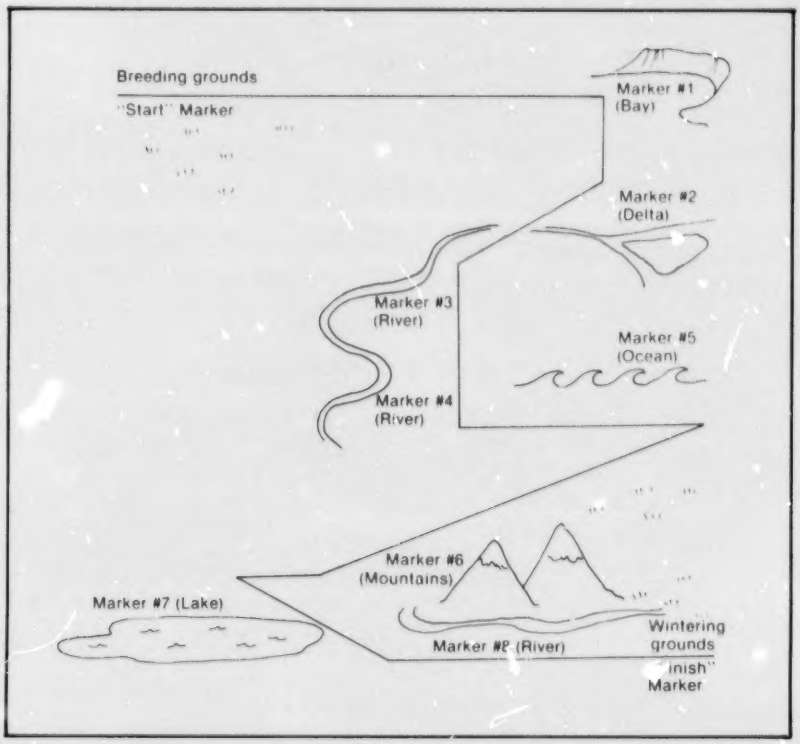
Department of the Interior/U.S. Fish and Wildlife Service, 1982

Name:


Breeding grounds
"Start" Marker
due E 30 paces
due S 5 paces
SW (compass heading 225 SW) 10 paces
due S 10 paces
WSW (compass heading 250 WSW) 25 paces
due E 15 paces
due W 5 paces
Wintering grounds
ESE (compass heading 110 ESE) 10 paces
due E 20 paces
"Finish" Marker

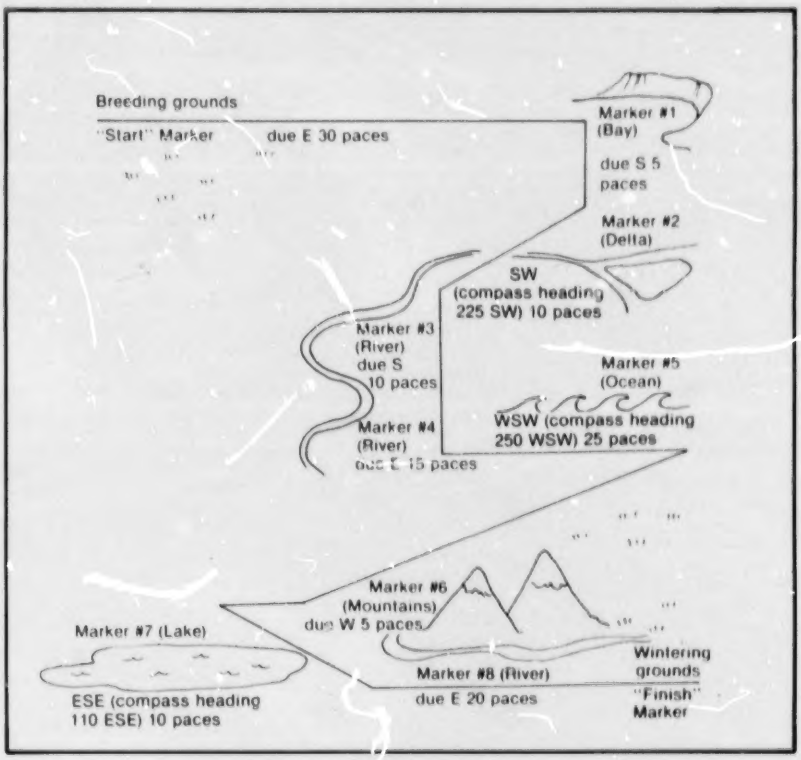
Compass Migration

Many birds seem to migrate through use of an ability to sense the magnetic field of the earth. They can therefore "tell" in which direction they are headed and set their flight accordingly.



Landmark Migration

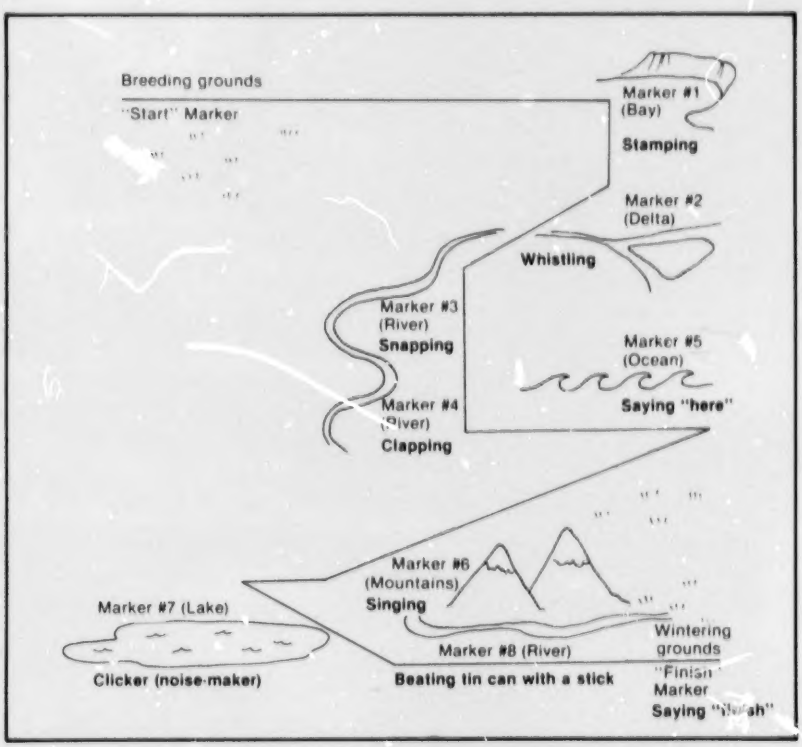
Birds seem able to instinctively remember landmarks from year to year. This is particularly remarkable when you realize that birds often fly at altitudes of 10,000 feet.


Breeding grounds
"Start" Marker
due E 30 paces
Marker #1 (Bay)
due S 5 paces
Marker #2 (Delta)
SW (compass heading 225 SW) 10 paces
Marker #3 (River) due S 10 paces
Marker #4 (River)
Marker #5 (Ocean)
WSW (compass heading 250 WSW) 25 paces
Marker #6 (Mountains) due W 5 paces
Marker #7 (Lake)
ESE (compass heading 110 ESE) 10 paces
Marker #8 (River)
due E 20 paces
Wintering grounds
"Finish" Marker

Timed Migration

(5 minutes)

Sometimes birds migrate, of necessity, in a very short time. Changing weather is the most common reason. Storms are often the most hazardous obstacles birds encounter while migrating.



Migration by Sound

Many birds are able to navigate because of their ability to hear low-frequency sounds that humans cannot hear. These sounds, like the surf against a distant beach, give birds an idea of where they are. Navigation by sound is particularly useful to night-flying birds.

Department of the Interior/U.S. Fish and Wildlife Service, 1982

Migratory Birds
Banding Reports

Activity 2

Data Sheet

Name:

1. Goose caught by hand in Maine, 8/16/81.
2. Neck-collared goose observed by person in New Jersey, 11/28/81.
3. Goose found dead by hunter in Maine, 10/16/81.
4. Band number of goose read from a distance by observer in Quebec, 7/9/81.
5. Hunter reports band from Pennsylvania, 11/12/81.
6. Goose caught after being forced down and weakened by bad weather in Pennsylvania, 12/30/77.
7. Goose shot by hunter in Missouri, 11/11/78.
8. Goose band sent in from Ontario with no information about recovery or cause of death, 8/4/81.
9. Hunter reports goose that was taken by his party in Iowa hunt, 10/13/81.
10. Goose banded in Iowa was identified by neck collar and reported from Wisconsin by resident, 9/19/81.
11. Skeleton of banded goose found and reported from Ohio, 9/8/81.
12. Goose recaptured almost a year later in the same place where banded in Wisconsin, 10/8/81.
13. Goose banded in Colorado killed by a hunter in Wyoming, 10/31/81.
14. Goose inadvertently caught by fur trapper in Manitoba, 10/10/81.
15. Goose banded in Oklahoma shot by hunter in Saskatchewan, 10/26/81.
16. Injured goose caught in Iowa, 11/28/81.
17. Goose banded 1/2/63 in Maryland and shot by hunter approximately 18 years later in Maryland, 11/12/81.
18. Goose banded in Manitoba shot three months later in Missouri, 11/8/81.
19. Goose banded in Manitoba 7/19/68 and recaptured near place of banding, 7/30/81.
20. Goose caught in Illinois after being hit by a vehicle, 7/29/81.
21. Goose banded in the Northwest Territories, Canada shot in Ohio three months later, 10/21/81.
22. Goose found dead in Massachusetts, 10/27/81.
23. Goose killed in Wisconsin by hunter, 10/29/81.
24. Goose banded in Ohio found injured in Michigan, 8/4/81.
25. Goose first banded 10/11/67, accidentally killed when recaptured in banding operation in Minnesota, 10/26/81.
26. Goose banded in Texas shot almost 13 years later in Manitoba, 10/2/81.
27. Goose banded in Utah identified by neck collar in California, 2/5/81.
28. Goose found dead on highway in Ontario, 9/1/81.
29. Goose collected for scientific specimen in Ohio, 4/27/81.
30. Goose found dead in South Dakota, 11/17/81.
31. Goose banded in Arkansas shot almost 17 years later in South Dakota, 10/20/78.
32. Goose found entangled in fishing gear in Michigan, 1/5/79.
33. Goose recaptured at the place of banding one year and one day later in Ontario, 6/22/81.
34. Goose captured after it joined a flock of domestic birds in Quebec, 6/23/81.
35. Goose shot by hunter in Ontario 40 days after it was banded, 8/3/81.
36. Band reported from North Dakota with no information regarding bird or circumstances of encounter, 6/15/81.
37. Goose found dead in Minnesota, 10/30/81.
38. Goose caught as a result of an unknown animal in Minnesota, 11/23/81.
39. Goose banded in Kansas 2/14/80 shot in Saskatchewan, 11/9/81.
40. Goose found injured in North Carolina, 6/28/80.
41. Goose found dead in New Jersey almost seven years after banding, 5/27/80.
42. Two geese banded on same day found dead almost a year later near a highway in Virginia, 1/5/72.
43. Goose banded in Kentucky 7/1/76 recaptured in Tennessee by another bander, 1/28/80.
44. Goose caught by a dog in Minnesota, 5/28/79.
45. Goose in Missouri found dead after striking a high tension wire, 3/8/79.
46. Ohio resident with binoculars reported a goose with a band number, 3/20/75.
47. Goose banded in Tennessee later recaptured by a bander in the Northwest Territories of Canada, 1/7/76.
48. Goose in British Columbia killed by a moving aircraft, 3/27/80.
49. Goose found dead due to parasite infestation in Minnesota, 7/22/80.
50. Goose found dead due to lead poisoning in South Dakota, 12/17/80.

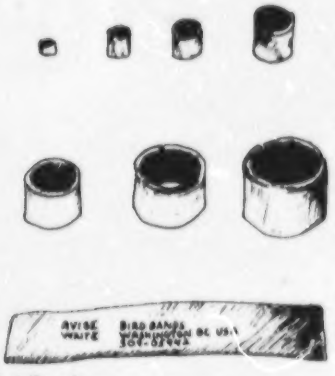
Name:

Canada Goose Migration

Canada geese migrate in a V-formation at about 50 mph. Their movement is steady and unhurried and closely follows the movement of the seasons.

Canada geese are often banded by scientists to obtain information about their migrations. Canada geese make their spring migrations (south to north) from about February to April. Fall migrations (north to south) occur from about September to December.

Canada geese in flight



Bird Bands

Start
Alberta, Canada
Disease Hits Flock
Lose 10 Cranes
Disease Controlled
by Biologists
Move Forward 2
Habitat
Found Suitable
for Feeding
Move Forward 2
Safe Resting
Spot
Poachers!
Lose 5 Cranes
Food is Scarce
Lose 10 Cranes
North Dakota
Habitat is
Destroyed
Move Back 1
Banding of Cranes
Move Forward 2
Collision with
Power Line
Lose 5 Cranes
Poor Visibility
Lose 3 Cranes
South Dakota
Blown Off Course
Lose 2 Turns
Safe Resting
Spot
Nebraska
Dangerous Route
Stormy Area Ahead
Move Forward 1
Good Weather
Move Forward 1
Safe Resting
Spot
Safe
Resting Spot
Move Forward 1
Kansas
Wildlife Refuge
Provides Food and
Cover
Move Forward 2
Storm Ends
Move Forward 1
Safe
Resting Spot
Safe
Resting Spot
Safe
Resting Spot
Finish
Texas
Exhaustion!
Move Back 2
Oklahoma
Storm Hits!
Lose 25 Cranes
Delayed by Storm
Move Back 1
Food is Scarce
Move Back 2
DETOUR
ROUTE

26

27

Name:

Name:

SAMPLE SCORE SHEET

NAME: _____

MARKER #_____

RUNNING TALLY OF CRANES: 100

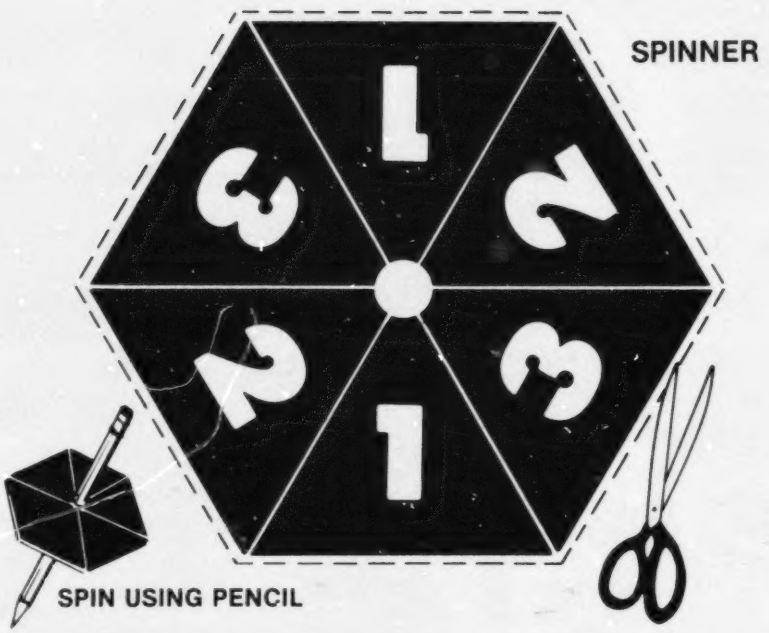
TOTAL SURVIVING CRANES:

_____

Directions

You have a flock of 100 whooping cranes. You are trying to get them from northern Alberta to Texas. Migration can be dangerous, so be careful!

1. Player with marker #1 begins the game, and play continues clockwise.
2. Each player spins the spinner and moves the corresponding number of spaces, following the instructions for that space. If the space contains no instruction, you may "rest" there with no penalty.
3. Players may take either route when they reach the detour.
4. Keep a running total of cranes in your flock on your score sheet. If you lose all your cranes, you are out of the game.
5. Game continues until all players have reached Texas for the winter. The player with the most cranes is the winner. If two players have the same number of cranes left, the one who reached Texas first wins.



Migratory Birds **Student Page** **Origami Bird**

Name:

Origami is the ancient Japanese art form of folding paper to create shapes. Here you will fold a large square sheet of colored paper to make a bird. Follow the directions carefully. Mark the letters in pencil on your paper.

1. Place an 8" square sheet of paper on the table with one of the corners towards you. Label the top point A, the left B, the bottom C, and the right D.

2. Fold B to D on line AC.

3. Open paper and fold BC to AC.

4. Fold DC to AC.

5. Put paper down so C is on the left. Label the top corner E and the bottom corner F.

6. Fold edge BE to meet edge CE.

7. Fold edge DF to meet edge CF.

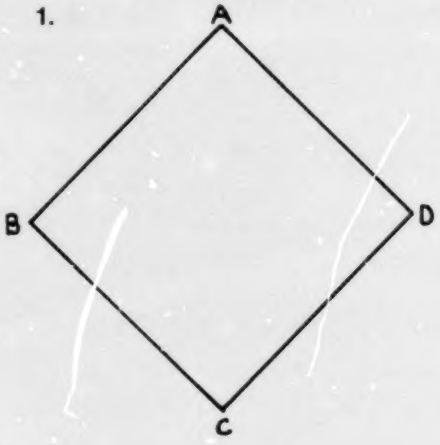
8. Turn paper over.

9. Fold up on line CA so that E falls on F. Label the diagonal line that is parallel to AF, G and H. Fold on line GH.

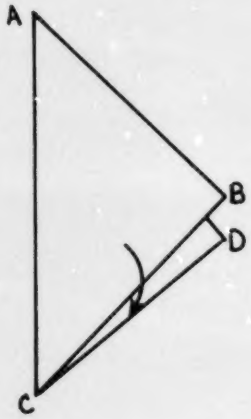
10. Open the shape at points F and E. Push the neck in between sides F and E, and crease on GH. Label a diagonal line on the neck I and J.

11. Fold the head down on IJ. Unfold and open the neck fold. Push the head down inside the neck fold.

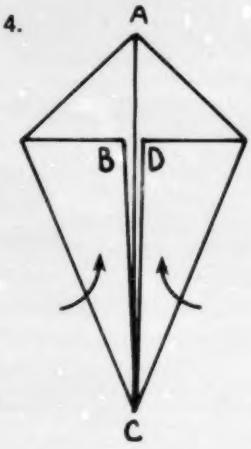
1.



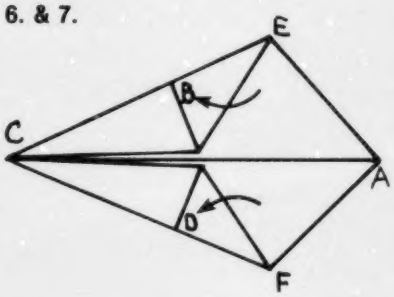
2.



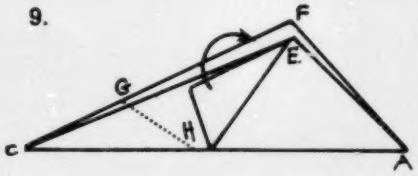
3. & 4.



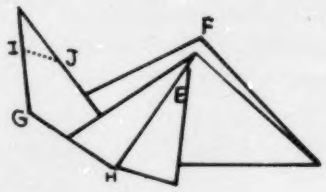
6. & 7.



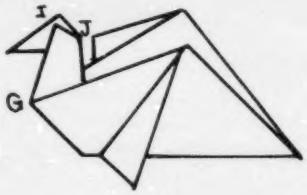
9.



10.



11.



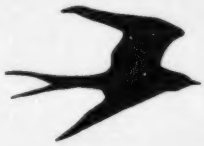
Name:

When studying migratory birds, it is important to be able to identify them in flight. Here are illustrations of six migratory bird species in flight. Below are their names and silhouettes of them at rest. Can you match the bird in flight to its name? You'll find the answers upside down at the bottom of this page.

1. ____

2. ____

3. ____



4. ____

5. ____

6. ____

---

a. Ruby-throated hummingbird

b. Mallard

c. Sandhill crane

d. Golden eagle

e. Arctic tern

f. Robin

1-f, 2-d, 3-c, 4-e, 5-a, 6-b.

Department of the Interior/U.S. Fish and Wildlife Service, 1982